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Cambio

A File Format Translation and Analysis Application for the Emergency Nuclear Response Community

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Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company,
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What is Cambio?

Cambio is an application intended to **automatically** read and display **any** spectrum file of **any** format in the world that the nuclear emergency response community might encounter.

Cambio also provides an analysis capability suitable for HPGe spectra when detector response and scattering environment are not well known.

Why is Cambio needed?

- **Cambio solves the following problem:**
 - **With over 50 types of formats from instruments used in the field and new format variations appearing frequently, it is impractical for every responder to have current versions of the manufacturer's software from every instrument used in the field.**
- **Cambio converts field spectra to any one of several common formats that are used for analysis, saving valuable time in an emergency situation.**
- **Cambio provides basic tools for comparing spectra, calibrating spectra, and isotope identification with analysis suited especially for HPGe spectra.**
- **Cambio has a batch processing capability to automatically translate a large number of archival spectral files of any format to one of several common formats, such as the IAEA SPE or the DHS N42.**



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What data elements does Cambio read?

- Spectral channel data (number of counts in each channel)
- Number of channels
- Energy calibration (if present)
- Date and time that the data were taken
- Real time (duration of the spectral acquisition)
- Live time (time that the electronics were available)
- Comments (provision for two different comments)
- Neutron counts
- Neutron acquisition time
- Background neutron counts
- Number of spectral records in the file

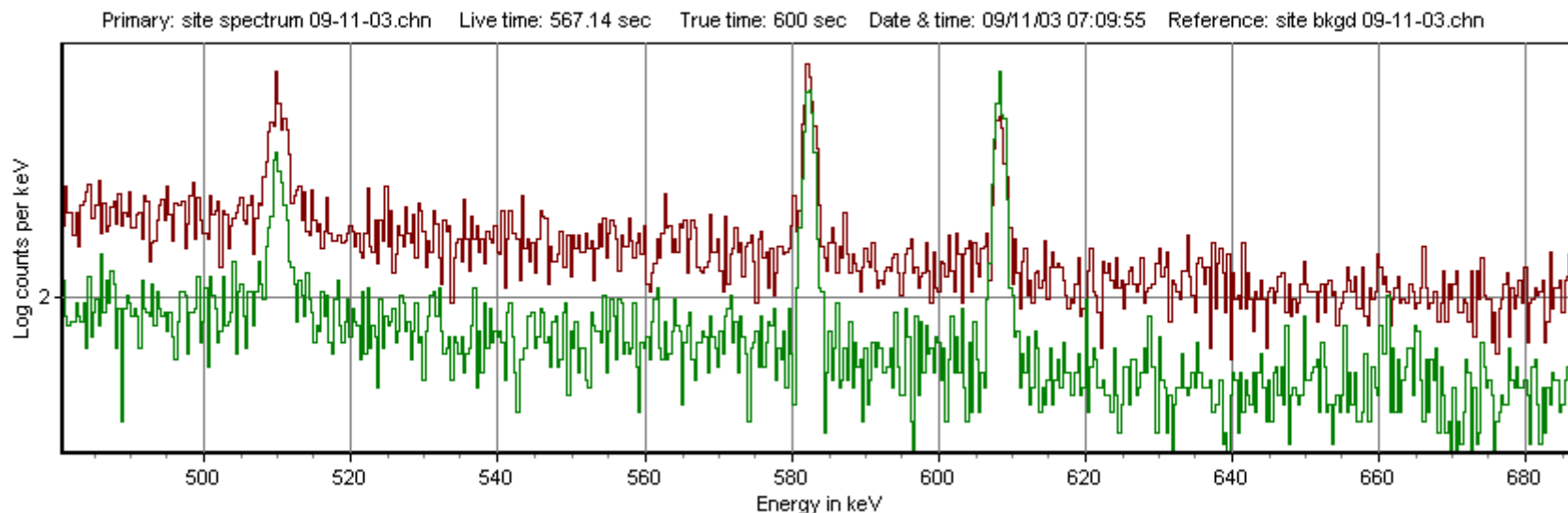
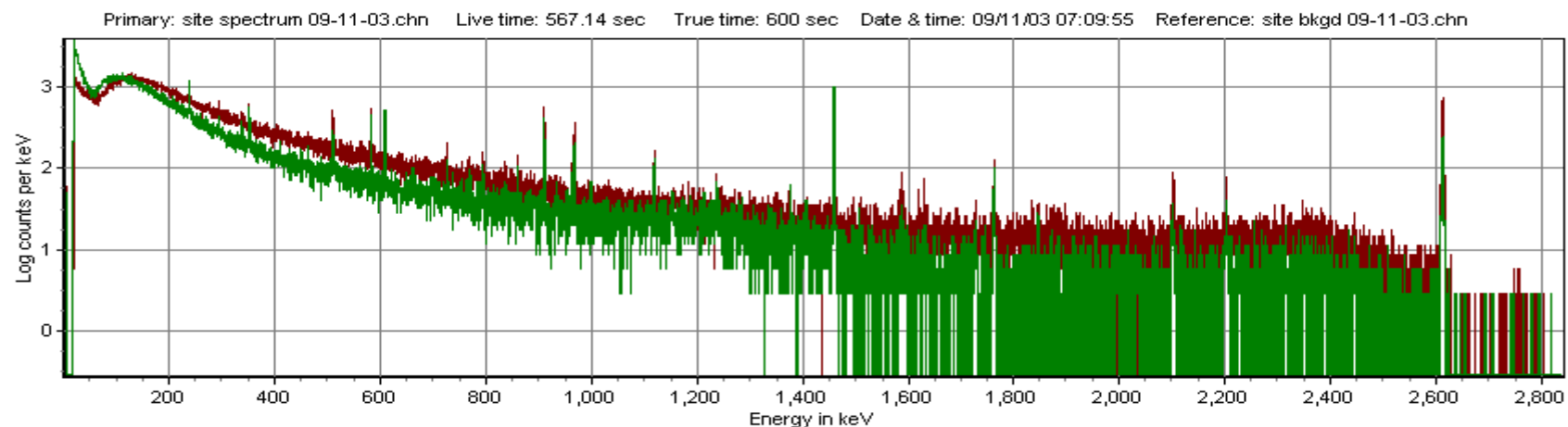
Who uses Cambio?

- **Currently over 540 analysts and members of the nuclear emergency response community worldwide are on the distribution list for updates to Cambio.**
- **Cambio users come from all levels of government, university, and commercial partners around the world that support efforts to counter terrorist nuclear activities.**
- **Cambio is Unclassified Unlimited Release (UUR) and distributed by internet downloads with email notifications whenever a new build of Cambio provides for new formats, bug fixes, or new or improved capabilities.**
- **Cambio is also provided as a DLL to the Karlsruhe Institute for Transuranium Elements so that Cambio's automatic file-reading capability can be included at the Nucleonica web site.**



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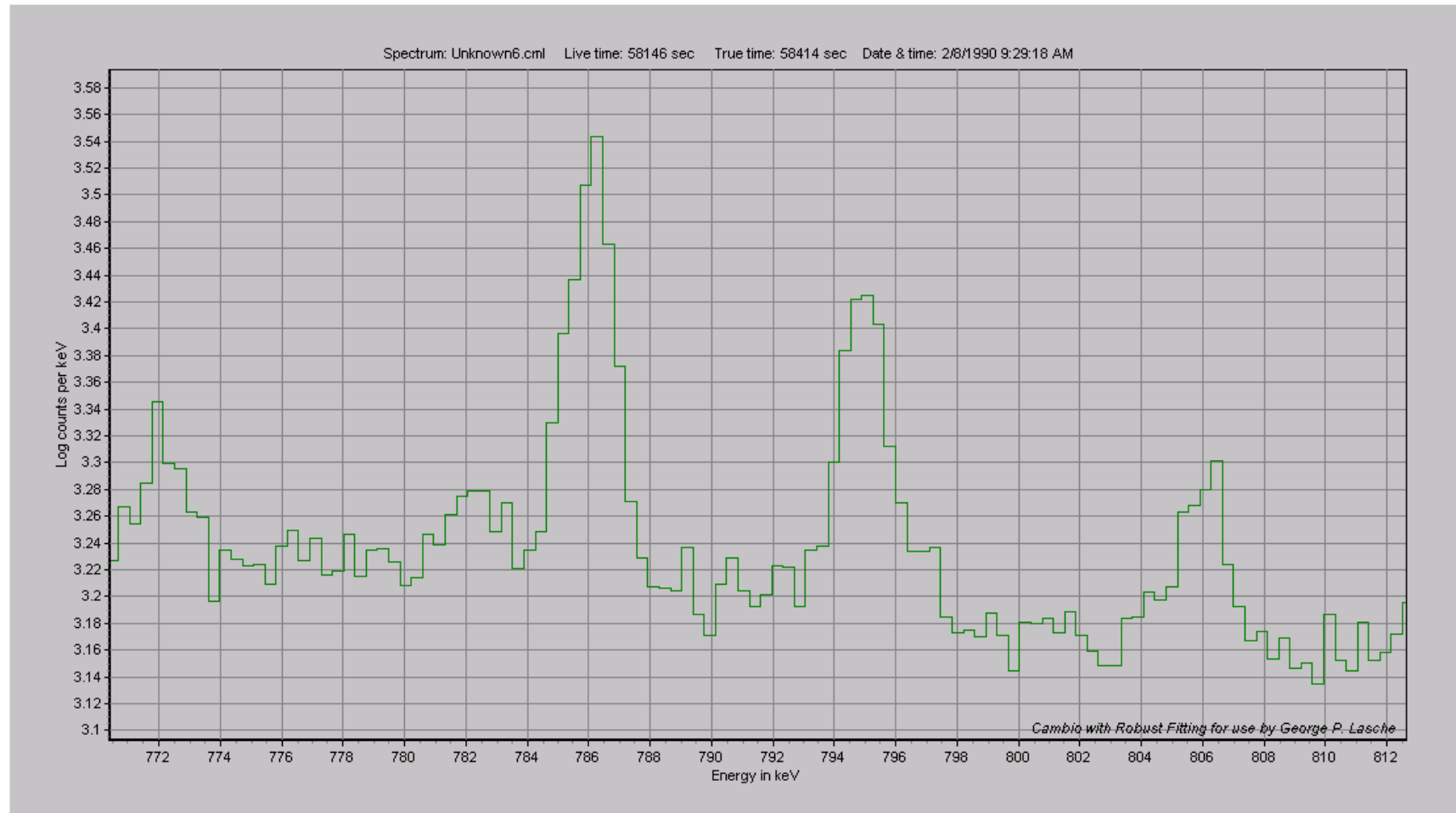
Cambio provides basic tools for analysis such as a graphics display and spectrum comparison





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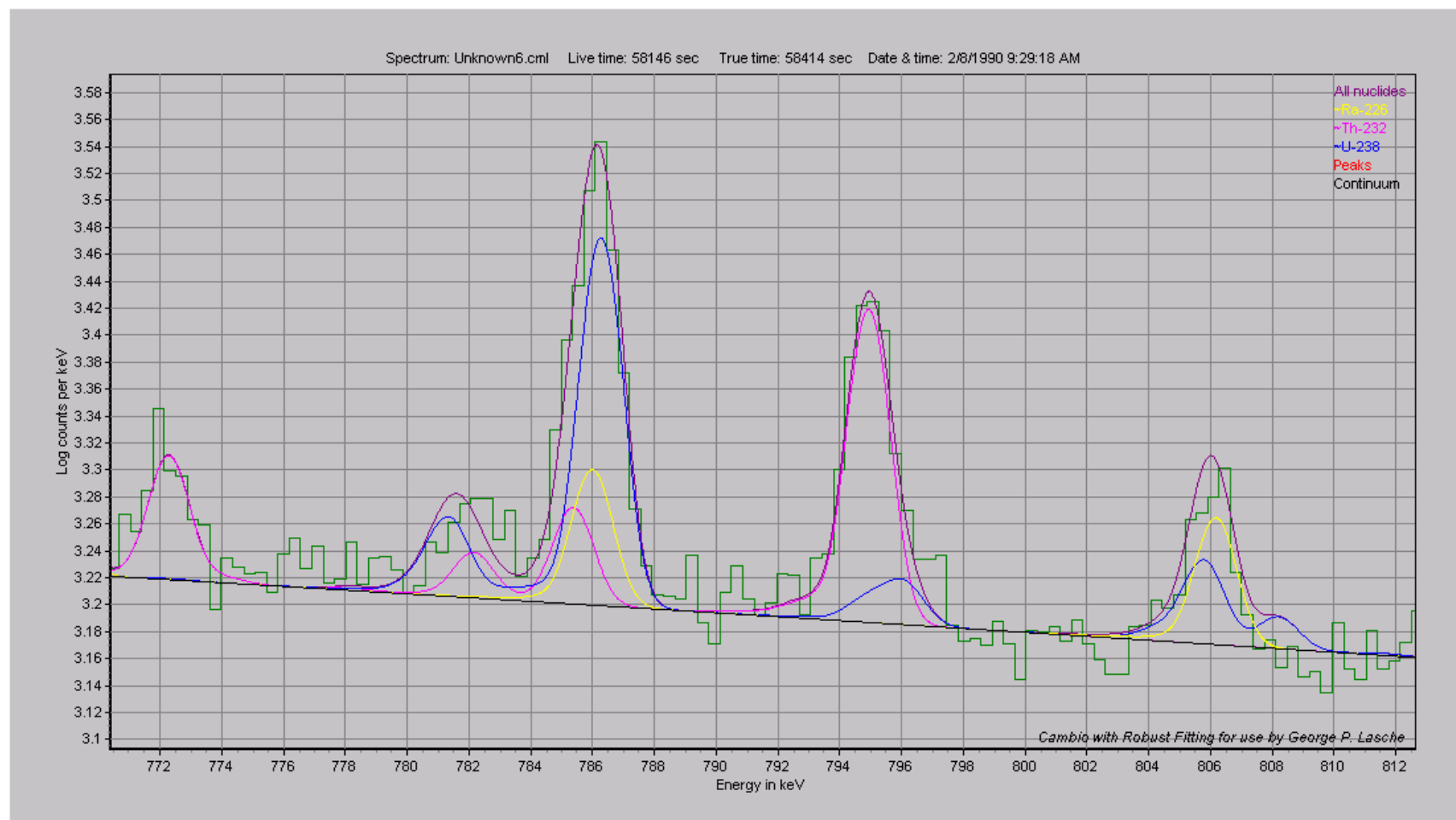
Cambio's full spectrum analysis – now in development and testing





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Fit to the sample data with ~Ra-226, ~U-238, ~Th-232



A partial list of Cambio formats

- ANSI N42.42 (coming soon: Revision 1)
- Aspect MKC (A-02, A-03)
- Berkeley Nucleonics SAM-935 and SAM-940 with QCC decompression and linearization
- Berthold LB-125 (includes multi-record files)
- Canberra CAM format (*.cnf) (includes detection of “counterfeit” variants)
- Canberra Accuspec (*.dat)
- Canberra Programmers Toolkit (*.tka)
- Canberra Inspector 1000 specific CAM format (*.cnf)
- CTC “MCS”
- Davidson (4 variants)
- Exploranium (multi-record files): Gr-130, Gr-135 v1 (2 variants), Gr-135 v2 (2 variants), ASCII (3 variants)
- FieldSpec (now IdentiFinder): Native SPC, FieldSpec-N and U variants, lcx SPE
- GADRAS (includes multi-record files): PCF, PCC (RAID, RIS, SMART), ASC
- LANL: GN-2 (multirecord); GN-3 (4 variants) (multi-record); Palm Pilot
- IAEA Generic SPE; Mini-MCA (*.spe); 3 methods date and time; 3 polynomial energy calibration; energy calibration from a series of channel-energy pairs
- Ortec: CHN, SPC (both integer and floating), SPE, Print-to-file ASCII
- PDR-78 (file extensions are actually sequence numbers)
- PGT Avalon (*.ans): Revision 1; Revision 2 and above
- Quantrad Ranger (multi-record)
- Rainbow Model 7010
- RobFit (FREE, HDTA, Z4DA; real and integer)
- SAIC RadSmart
- STE Pager-X
- STL Cadillac (ASC and CSV)
- STL Yugo
- Target NanoSpec
- TRACS
- XIA Polaris (*.itx)
- XRF ICS-4000 (2 variants)



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Some Cambio conversion formats

Analysis:

- IAEA SPE
- ANSI N42.42 XML
- ORTEC CHN
- Canberra Accuspec DAT
- GADRAS PCF
- GADRAS ASC
- Channel-Tab-Value ASCII
- Excel CSV

Training:

- ICX SPC identiFINDER (formerly FieldSpec)
- ORTEC SPC for Detective EX
- Gr-130 DAT (Exploranium-SAIC)
- Gr-135 DAT (Exploranium-SAIC)

How to get on the Cambio distribution list

- Send an email to George Lasche at George.Lasche@alum.mit.edu
- Include your name and organization as you would like to see it
- No restrictions
- No fees



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Practical Exercises

- **Using Cambio on the Nucleonica Site for file conversions**
- **Using Cambio as a standalone for analysis**
- **Questions and answers**